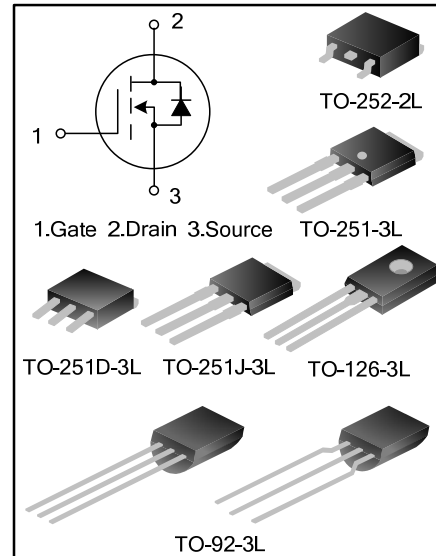


## 1A, 600V N-CHANNEL MOSFET

### GENERAL DESCRIPTION

SVFM/MJ/N/B/D is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ structure VDMOS technology. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

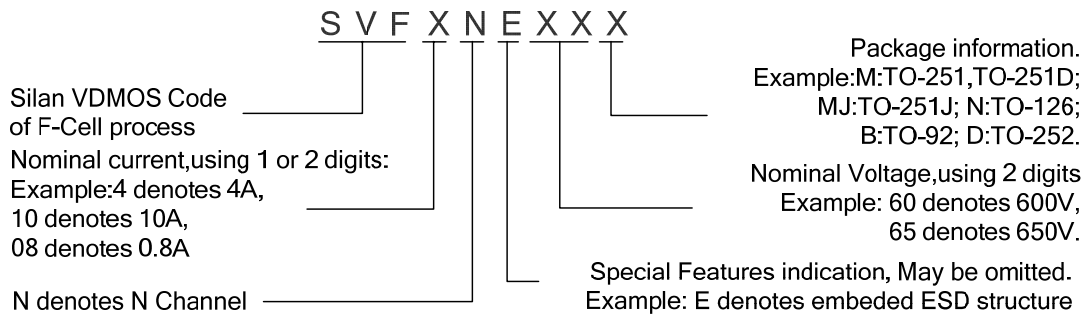
These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.



### FEATURES

- \* 1A,600V, $R_{DS(on)}$  (typ.) =8.2Ω@ $V_{GS}=10V$
- \* Low gate charge
- \* Low Crss
- \* Fast switching
- \* Improved dv/dt capability

### NOMENCLATURE



### ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SVF1N60M	TO-251-3L	SVF1N60M	Pb free	Tube
SVF1N60M	TO-251D-3L	SVF1N60M	Pb free	Tube
SVF1N60MJ	TO-251J-3L	SVF1N60MJ	Pb free	Tube
SVF1N60N	TO-126-3L	SVF1N60N	Pb free	Bulk
SVF1N60B	TO-92-3L	F1N60	Pb free	Bulk
SVF1N60BTR	TO-92-3L	F1N60	Pb free	AMMO
SVF1N60D	TO-252-2L	SVF1N60D	Pb free	Tube
SVF1N60DTR	TO-252-2L	SVF1N60D	Pb free	Tape & Reel

**ABSOLUTE MAXIMUM RATINGS** (T<sub>C</sub>=25°C unless otherwise noted)

Characteristics	Symbol	Rating				Unit
		SVF1N 60B	SVF1N 60M/D	SVF1N 60MJ	SVF1N 60N	
Drain-Source Voltage	V <sub>DS</sub>	600				V
Gate-Source Voltage	V <sub>GS</sub>	±30				V
Drain Current	I <sub>D</sub>	1.0				A
		0.63				
Drain Current Pulsed	I <sub>DM</sub>	1.5	4.0			A
Power Dissipation(T <sub>C</sub> =25°C) -Derate above 25°C	P <sub>D</sub>	9	28	29	25	W
		0.07	0.22	0.23	0.20	W/°C
Single Pulsed Avalanche Energy (Note 1)	E <sub>AS</sub>	52				mJ
Operation Junction Temperature Range	T <sub>J</sub>	-55~+150				°C
Storage Temperature Range	T <sub>stg</sub>	-55~+150				°C

**THERMAL CHARACTERISTICS**

Characteristics	Symbol	Rating				Unit
		SVF1N 60B	SVF1N 60M/D	SVF1N 60MJ	SVF1N 60N	
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	13.89	4.46	4.31	5	°C/W
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	120	110	110	62.5	°C/W

**ELECTRICAL CHARACTERISTICS** (T<sub>C</sub>=25°C unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	B <sub>VDS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	600	--	--	V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V	--	--	1.0	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	--	--	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	2.0	--	4.0	V
Static Drain- Source On State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =0.5 A	--	8.2	11	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHZ	--	120.3	--	pF
Output Capacitance	C <sub>oss</sub>		--	19.0	--	
Reverse Transfer Capacitance	C <sub>rss</sub>		--	0.8	--	
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =300V, I <sub>D</sub> =1.0A, R <sub>G</sub> =25Ω  (Note 2,3)	--	6.47	--	ns
Turn-on Rise Time	t <sub>r</sub>		--	13.27	--	
Turn-off Delay Time	t <sub>d(off)</sub>		--	7.73	--	
Turn-off Fall Time	t <sub>f</sub>		--	15.87	--	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =480V, I <sub>D</sub> =1.0A, V <sub>GS</sub> =10V  (Note 2,3)	--	3.45	--	nC
Gate-Source Charge	Q <sub>gs</sub>		--	1.10	--	
Gate-Drain Charge	Q <sub>gd</sub>		--	1.39	--	



**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.		Unit
					SVF1 N60B	Others	
Continuous Source Current	$I_S$	Integral Reverse P-N Junction Diode in the MOSFET	--	--	1.0		A
Pulsed Source Current	$I_{SM}$		--	--	1.5	4.0	
Diode Forward Voltage	$V_{SD}$	$I_S=1.0A, V_{GS}=0V$	--	--	1.5		V
Reverse Recovery Time	$T_{rr}$	$I_S=1.0A, V_{GS}=0V,$	--	246.08	--		ns
Reverse Recovery Charge	$Q_{rr}$	$dIF/dt=100A/\mu S(\text{Note } 2)$	--	0.53	--		$\mu C$

**Notes:**

1.  $L=30mH, I_{AS}=1.74A, V_{DD}=85V, R_G=25\Omega,$  starting  $T_J=25^\circ C;$
2. Pulse Test: Pulse width  $\leq 300\mu s,$  Duty cycles  $\leq 2\%;$
3. Essentially independent of operating temperature.

**TYPICAL CHARACTERISTICS**

Figure 1. On-Region Characteristics

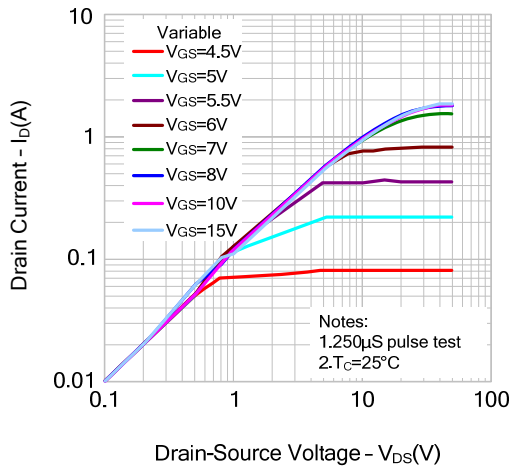


Figure 2. Transfer Characteristics

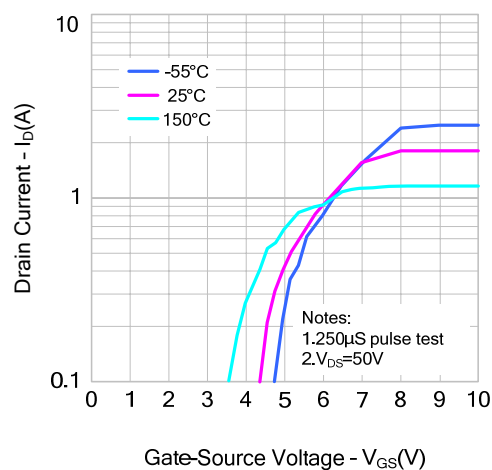


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

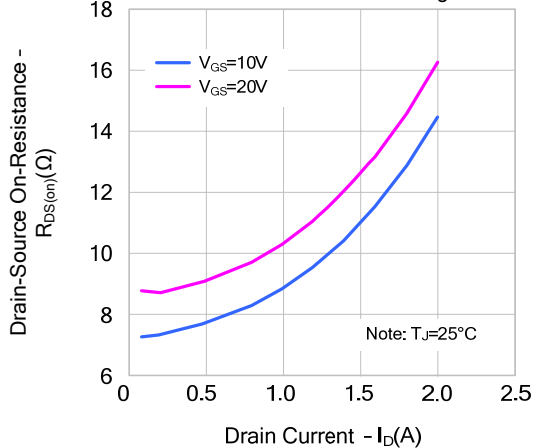
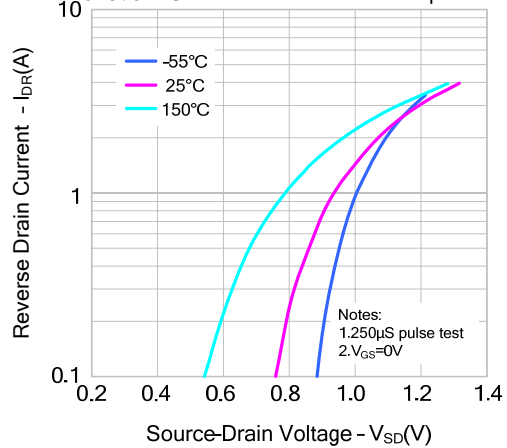


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature





TYPICAL CHARACTERISTICS (continued)

Figure 5. Capacitance Characteristics

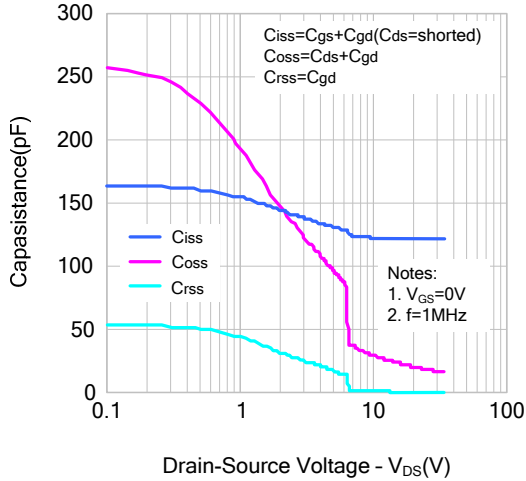


Figure 6. Gate Charge Characteristics

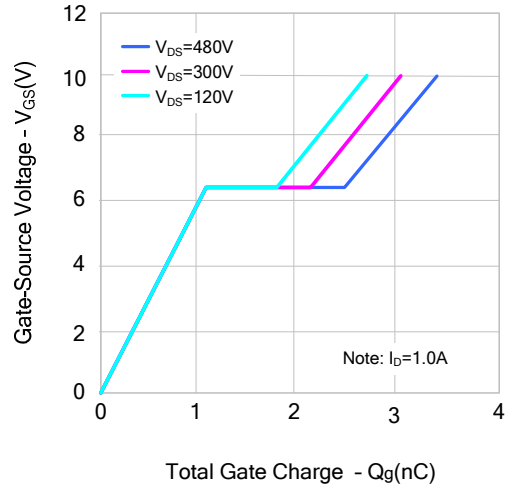


Figure 7. Breakdown Voltage Variation vs. Temperature

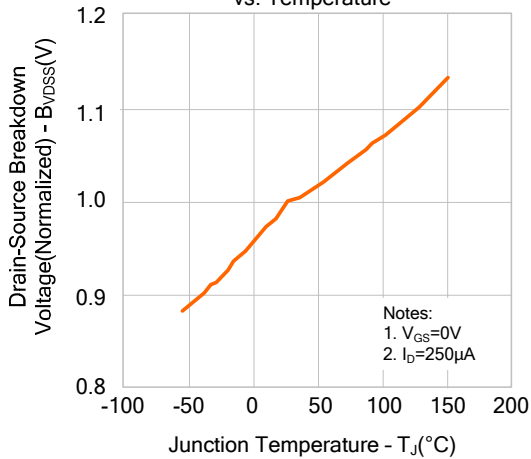


Figure 8. On-resistance Variation vs. Temperature

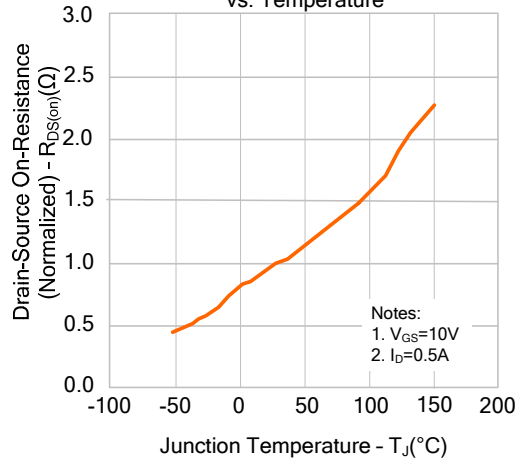


Figure 9-1. Max. Safe Operating Area(SVF1N60B)

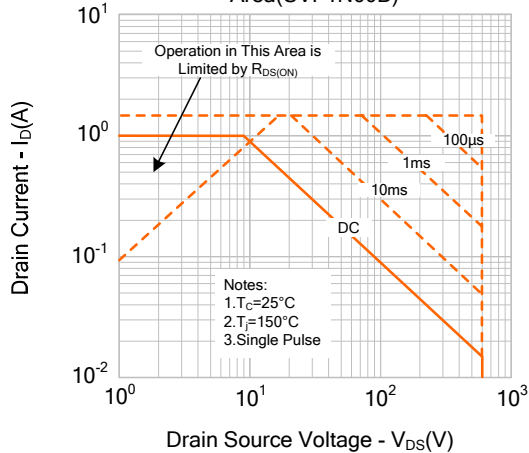
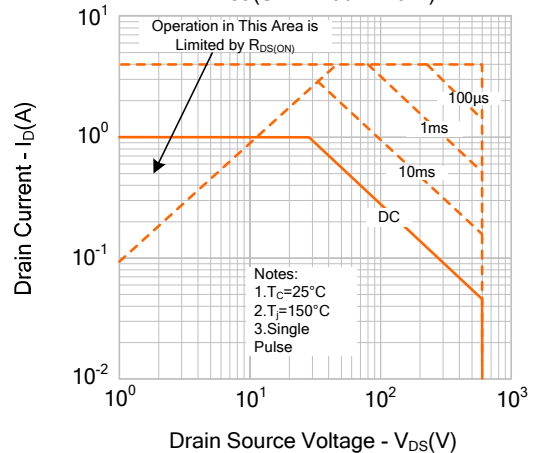
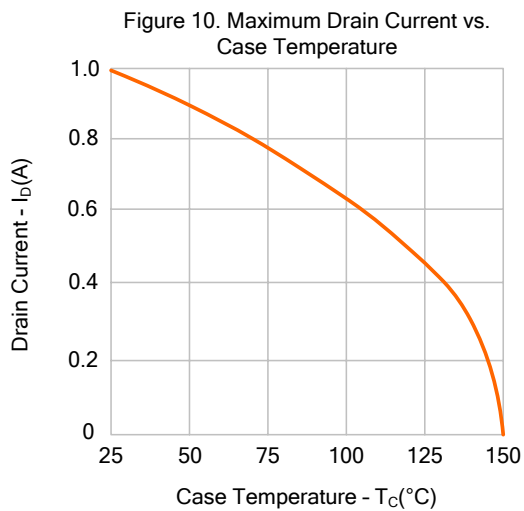
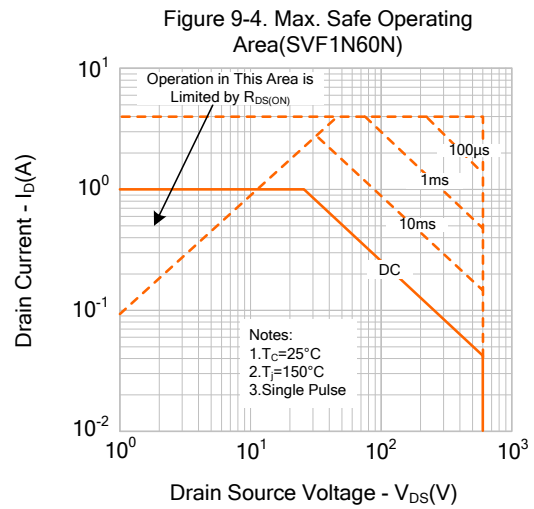
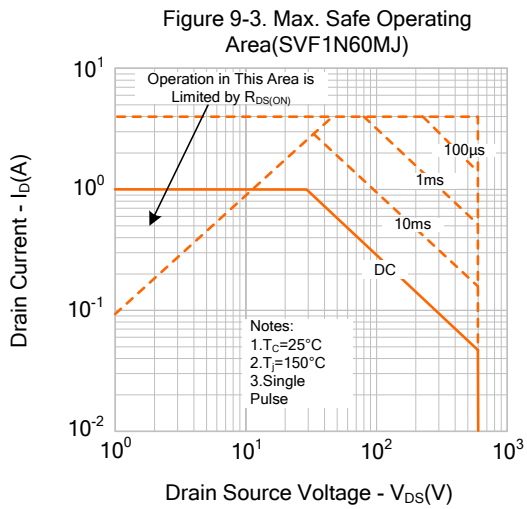


Figure 9-2. Max. Safe Operating Area(SVF1N60M/MJ/D)



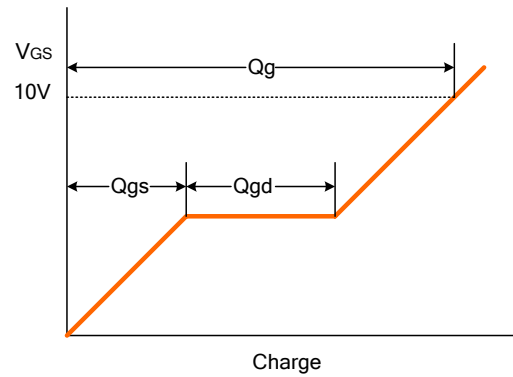
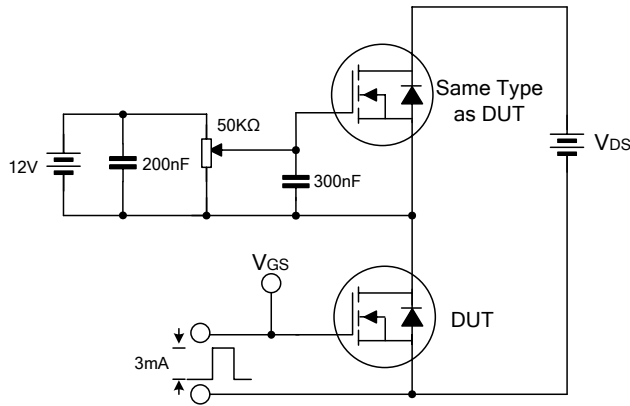


## TYPICAL CHARACTERISTICS (continued)

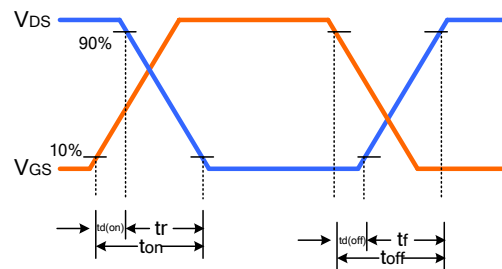
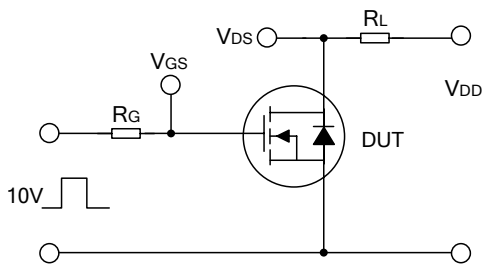


**TYPICAL TEST CIRCUIT**

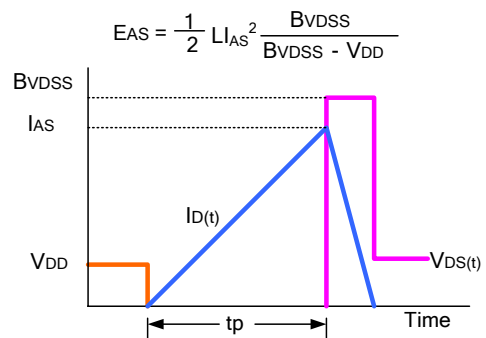
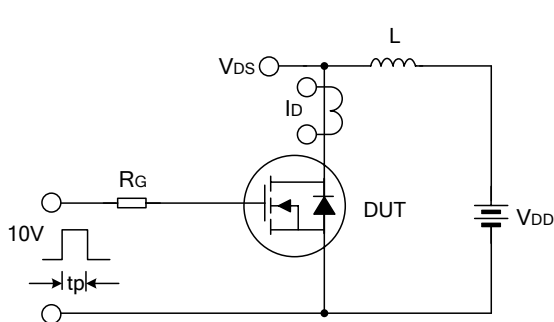
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



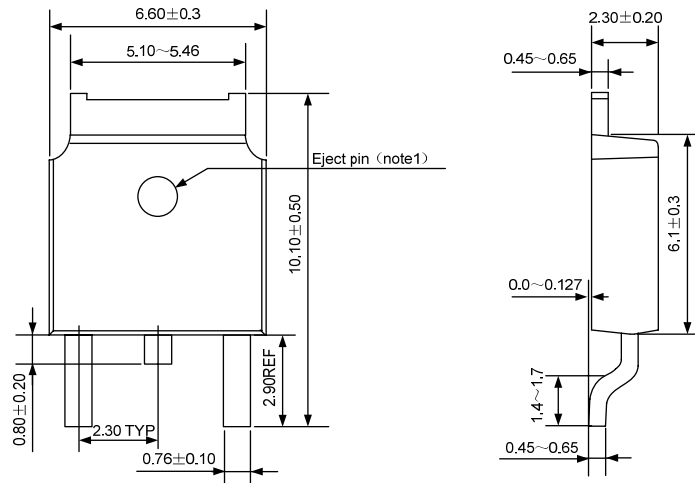
Unclamped Inductive Switching Test Circuit & Waveform



**PACKAGE OUTLINE**

**TO-252-2L(1)**

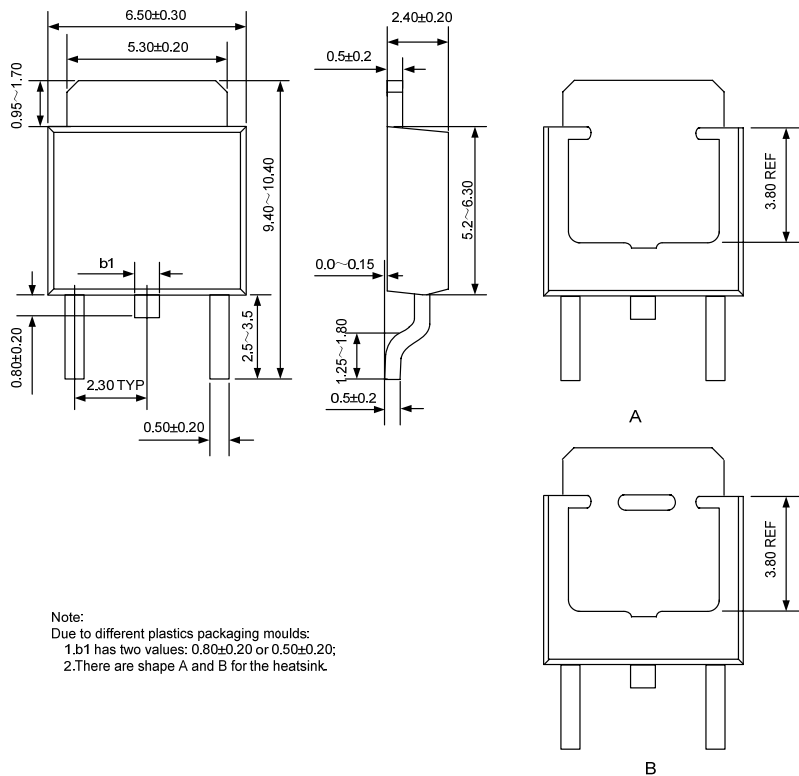
**UNIT: mm**



NOTE1 : There are two conditions for this position:has an eject pin or has no eject pin.

**TO-252-2L(2)**

**UNIT: mm**



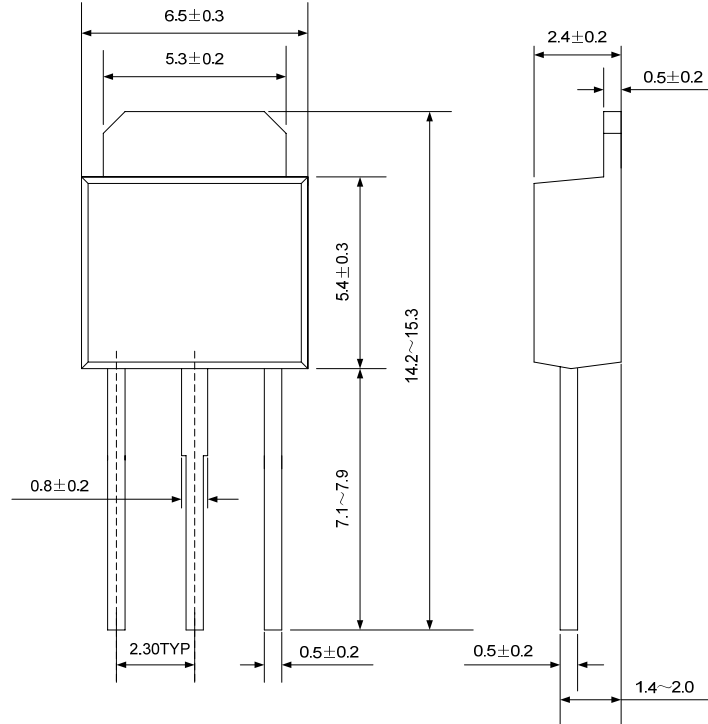
Note:  
Due to different plastics packaging moulds:  
1.b1 has two values:  $0.80 \pm 0.20$  or  $0.50 \pm 0.20$ ;  
2. There are shape A and B for the heatsink.



## PACKAGE OUTLINE (continued)

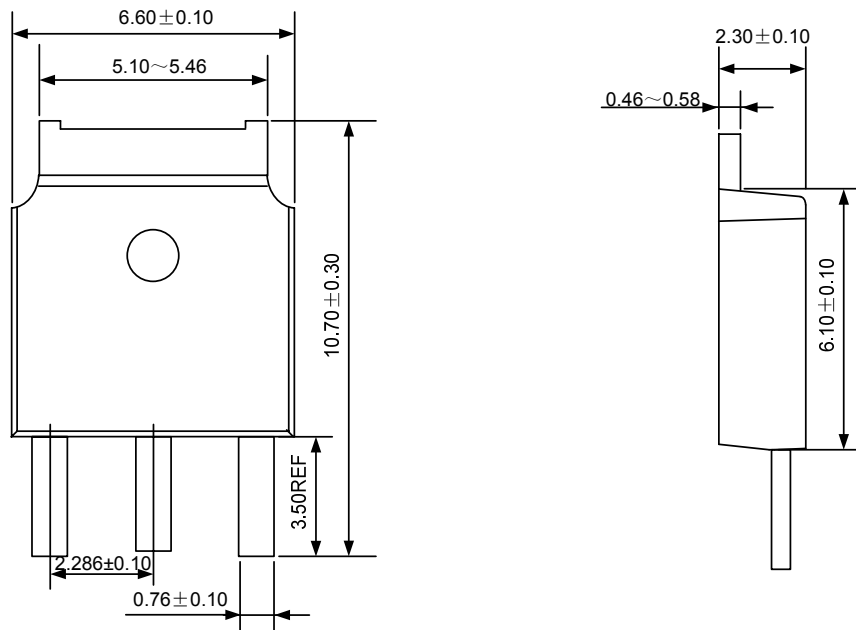
TO-251-3L

UNIT: mm



TO-251D-3L

UNIT: mm



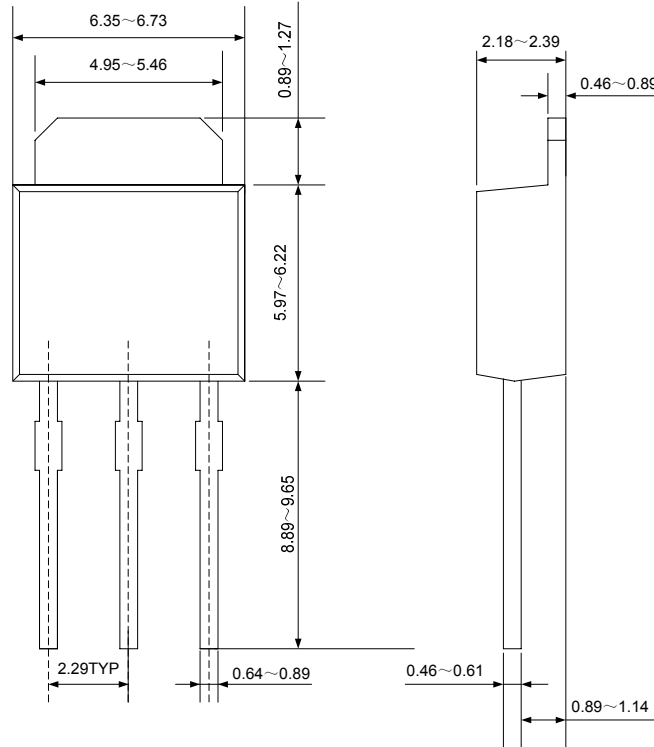




## PACKAGE OUTLINE (continued)

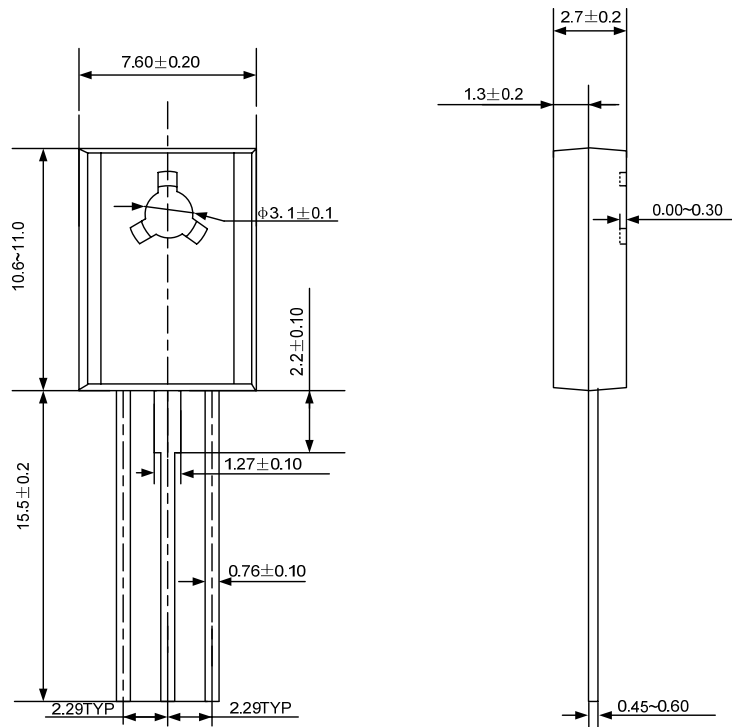
TO-251J-3L

UNIT: mm



TO-126-3L

UNIT: mm

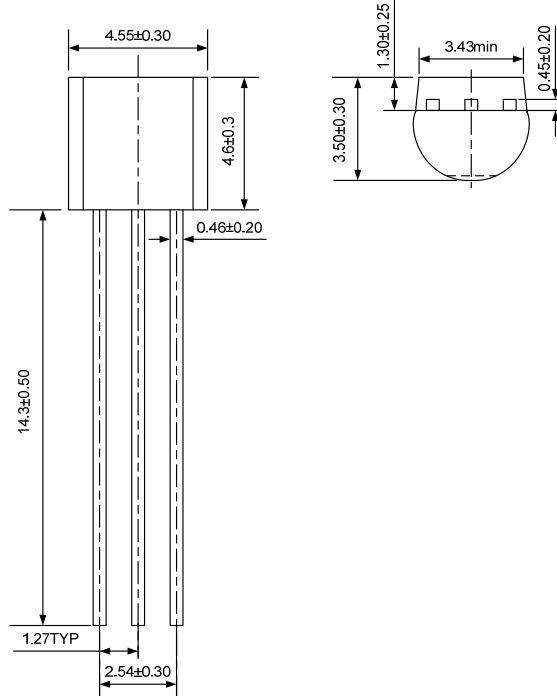




## PACKAGE OUTLINE (continued)

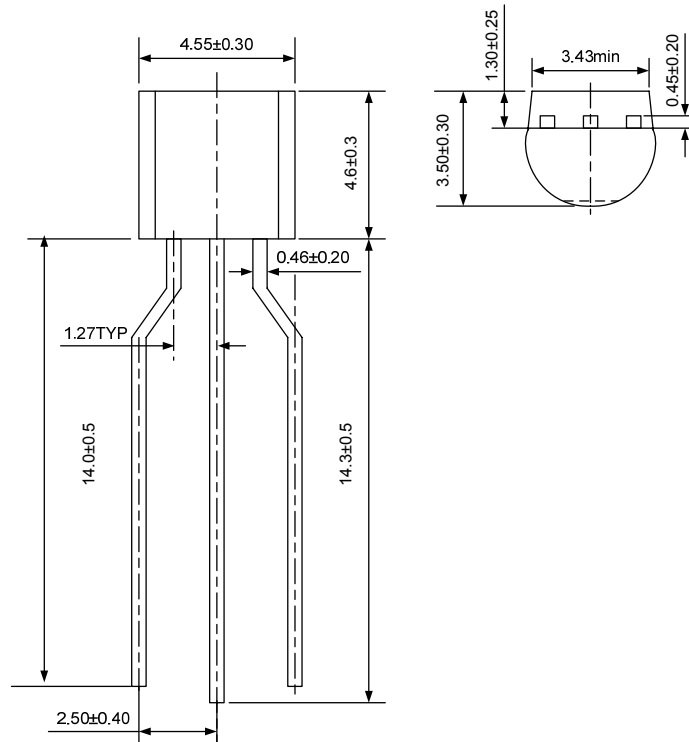
TO-92-3L(1)

UNIT: mm



TO-92-3L(2)

UNIT: mm





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- Silan reserves the right to make changes to the information herein for the improvement of the design and performance without further notice! Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.
- All semiconductor products malfunction or fail with some probability under special conditions. When using Silan products in system design or complete machine manufacturing, it is the responsibility of the buyer to comply with the safety standards strictly and take essential measures to avoid situations in which a malfunction or failure of such Silan products could cause loss of body injury or damage to property.
- Silan will supply the best possible product for customers!

## ATTACHMENT

### Revision History

Date	REV	Description	Page
2011.03.30	1.0	Original	
2011.06.29	1.1	Add the package of TO-251D-3L, TO-251J-3L, TO-126-3L	
2011.09.02	1.2	Modify "PACKAGE OUTLINE"	
2011.12.31	1.3	Modify "ELECTRICAL CHARACTERISTICS" and the capacitance characteristic curve; Modify the $I_{DM}$ of SVF1N60B	
2012.06.04	1.4	Modify the value of "Reverse Recovery Time"; Update the package outline of TO-251D-3L	